ENERGY EFFICIENCT RETROFIS & GREEN BUILDING PRACTICES

Mashood Rahman
Regional Marketing Manager, Aftermarket & Energy
Johnson Controls
Dubai, UAE

ABSTRACT

According to the recent survey more and more concern being expressed throughout the Middle East regions that the power generation companies are suffering with shortage of power during the peek hours and consequently unable to meet the power demand. Moreover, the increase in demand is also causing rise in pollution levels.

Therefore, the subject of energy efficient retrofits and green building practices is becoming increasingly important. Based on the latest walkthrough energy audit it is proven that 65% of electricity is consumed by Air Conditioning System resulting average energy consumption by 250kWh/year/sqmeter of a residential complex.

INTRODUCTION

In order to improve energy efficiency it is necessary is to figure out how, when, where, and why energy is used into the facility and without measurement and verification it is not feasible to achieve savings because measurement is must or else it cannot be controlled. Nevertheless, the mission of Green Building Practices also describes waste cost savings, water use savings, carbon savings and energy savings.

Walkthrough Energy Audit; first step in improving energy, starting right from the bottom; establish goal, calculate energy cost, calculate consumption, compare and benchmark with other facilities, define facility improvement measures, implement facility improvement measures, calculate energy savings, perform necessary operation and maintenance.

Detail Energy Audit; develop a chart and define the list of equipment including total connected load and percentage of power consumption of individual equipment. Compare the power consumption actual vs. design and carryout the efficiency and performance test with help of meters. This exercise will provide the efficiency of individual equipment in term of performance and will also demonstrate the energy wastage due to the non performance of equipment.

The energy saving calculator will be introduced to measure the energy saving based on selected facility improvement measures and calculate the return on investment.

Energy Efficient Retrofits, Introduction; Energy Efficient Retrofits is a concept that covers multiple disciplines to ensure functionality of the building environment by integrating all equipment to meet efficient operation.

It quantifies current energy consumption and cost, gives an overall energy efficiency rating to the facility and estimates the likely potential for energy cost savings resulting from improved energy efficiency.

Benefits; Improving energy efficiency is important for a number of reasons:

- ✓ Utility bills are reduced, making the business more profitable and competitive.
- ✓ Comfort levels are increased for staff, which can improve productivity.
- ✓ Increase life of the equipment, provide trouble free operation and minimize equipment down time
- ✓ Energy usage is reduced, which reduces emissions of carbon dioxide and therefore helps sustainability goals.

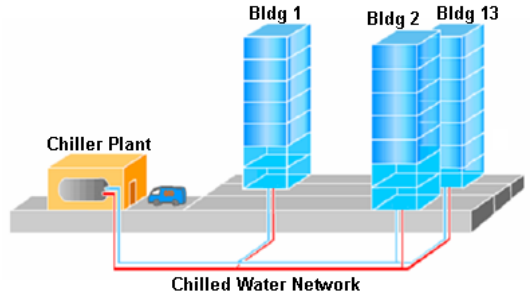
Project Summary; Qatar University was built in 1984. The university has a student population of over 5,000. The project is situated 10 km north of Doha city center and 4 km from Al Markhiah. Total site area is 2,500,000 square meters and floor area is 85,000 square meters.

All the academic buildings are planned within a ring road with sports and ancillary facilities to the outside. The layout of academic buildings is based on grid forms, an octagon 8.4 m in width and a square with sides of 3.5 m.

There are total 13 buildings as described below:

- CSU Building
- BOD Building
- Men’s College Of Science
- Men's Engineering College
- Engineering Annex
- Engineering Workshop
- Main Men's Building
- Main Women’s Building
- High Administration Building
- Men’s Library Building
- Mosque
- New Women’s Science College, Sections A&B
- Mass Communication

The project is provided with a centralized production and distribution of chilled water plant for cooling.



Chilled water is delivered via an underground pipeline to all the facilities to provide air conditioning.

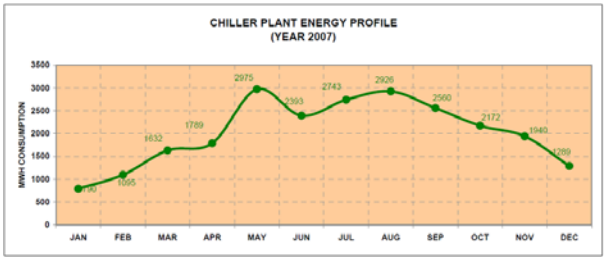
Each facility is equipped with multiple Fan Coil and Air Handling Units to provide comfort space temperature in conjunction with Fresh Air to meet a required Indoor Air Quality.

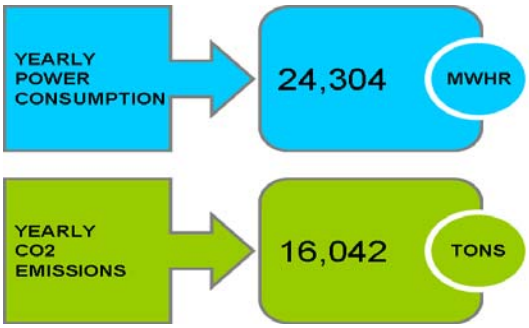
Before Retrofits; The central chiller plant was equipped with 4 Chillers each Chiller was provided with Multi Stage Centrifugal Compressor.

Each Chiller was connected to an individual Radiator for Heat Rejection, each Radiator was provided with 4 Fan and Motors.

The plant was also equipped with 4 constant speed Chilled Water Pumps that distributes the chilled water to the entire facilities for cooling application.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL (MWHR)
MWHR, 2007	790	1095	1632	1789	2975	2393	2743	2926	2560	2172	1940	1289	24,304





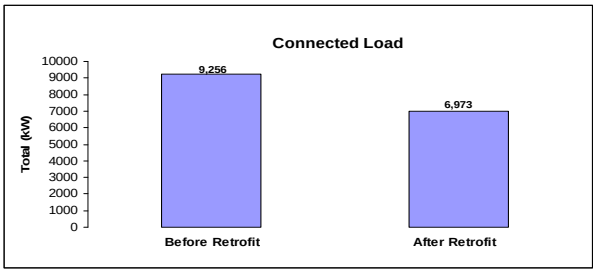
After Retrofits; The existing Chillers were replaced with 6 New High Efficiency Water Cooled Centrifugal Chillers each Chiller was provided with Single Stage Centrifugal Compressor. Three Chillers are provided with Variable Speed Drives (VSD) where as three remaining chillers are provided with Solid State Starters (SSS).

A Variable Speed Drive (VSD) Chiller Significantly Reduces Power consumption by 20% to 30% on an average operating condition.

This represents a significant energy savings and a significant reduction in equivalent CO2 emissions per chiller.

The existing Chilled Water Pumps were replaced with 7 High Efficiency Chilled Water Pumps each Chiller was provided with Variable Frequency Drive (VSD). The VSD modulate based on the signal received from Differential Pressure Transmitter located at the index point to maintain the required Chilled Water Flow.

The existing Radiators were replaced with Cooling Tower, each Chiller was connected to Cooling Tower for Heat Rejection through a common header utilizing 7 High Efficiency Condenser Water pumps.



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T R A N S F O R M A T I O N P E R I O D													
MWHR, 2009	439	719	526	677	844	1127	1169	1114	1221	1052	877	350	10,115